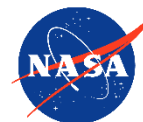


LEMUR 3

A Limbed Climbing Robot for Extreme Terrain Mobility in Space

Aaron Parness, **Neil Abcouwer**, Christine Fuller, Nicholas Wiltsie, Jeremy Nash, Brett Kennedy

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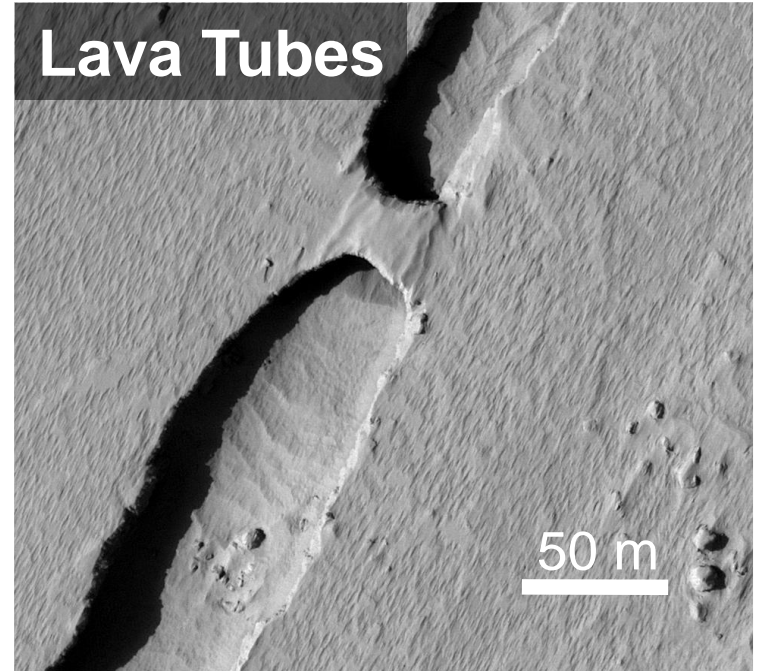
Jet Propulsion Laboratory
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Motivation – Mobility beyond Wheels

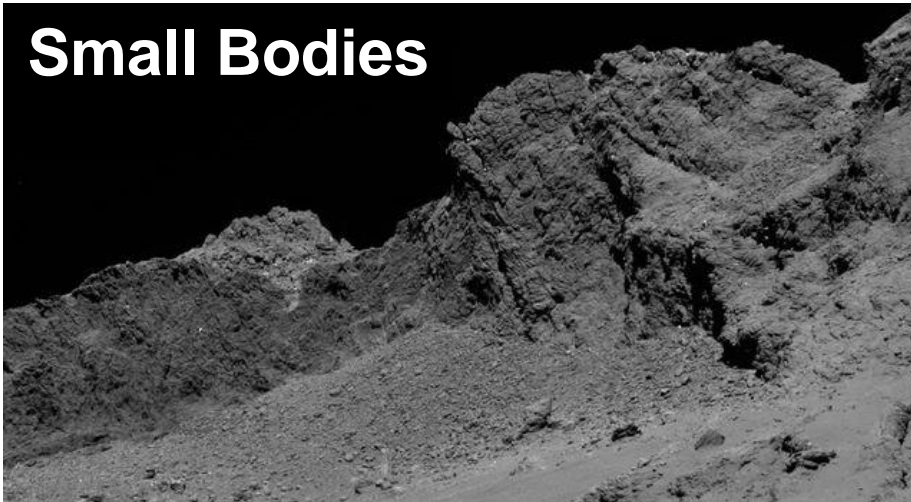
Stratification



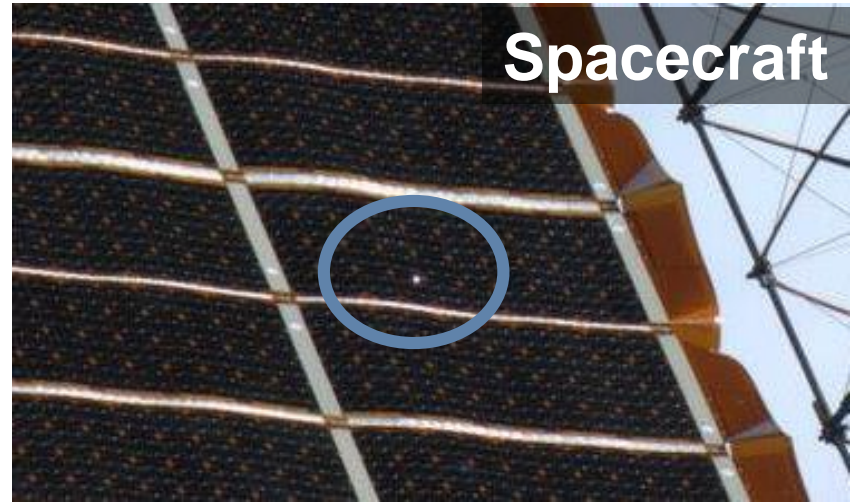
Lava Tubes



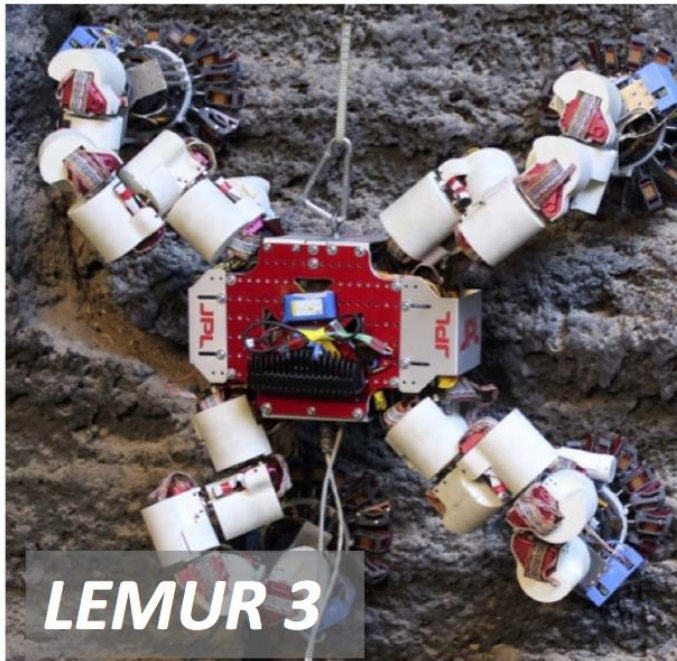
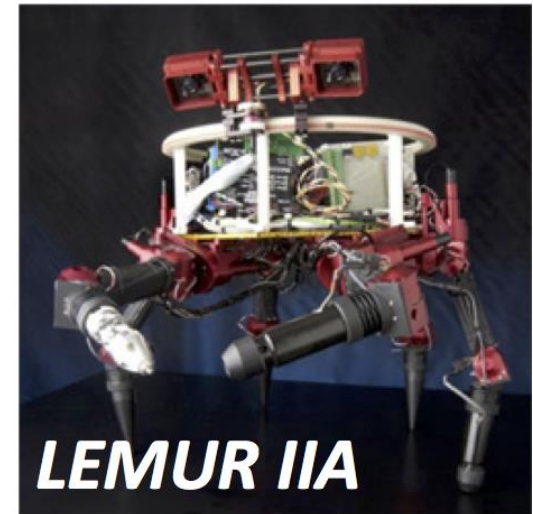
Small Bodies



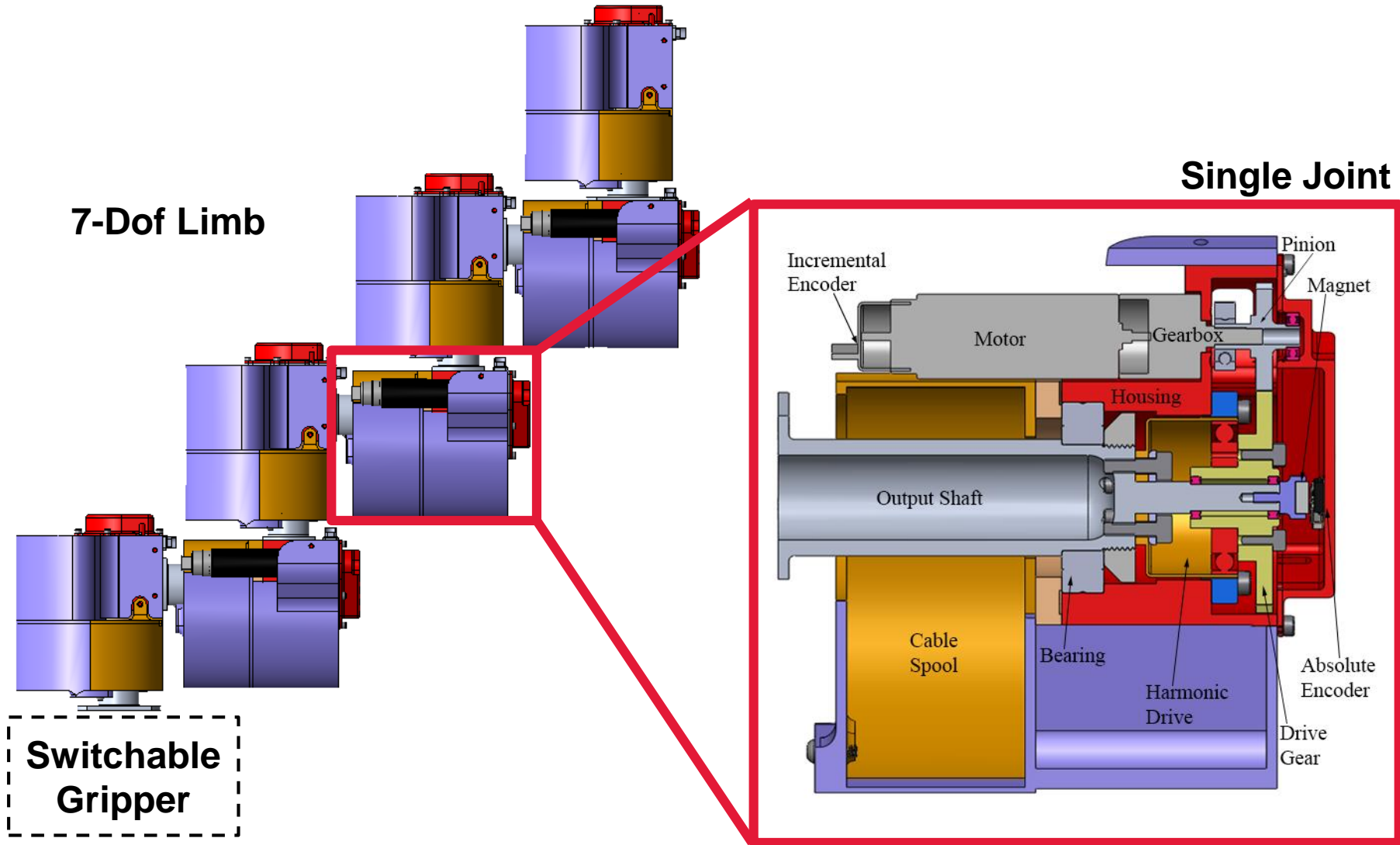
Spacecraft



Limbed Robots at JPL

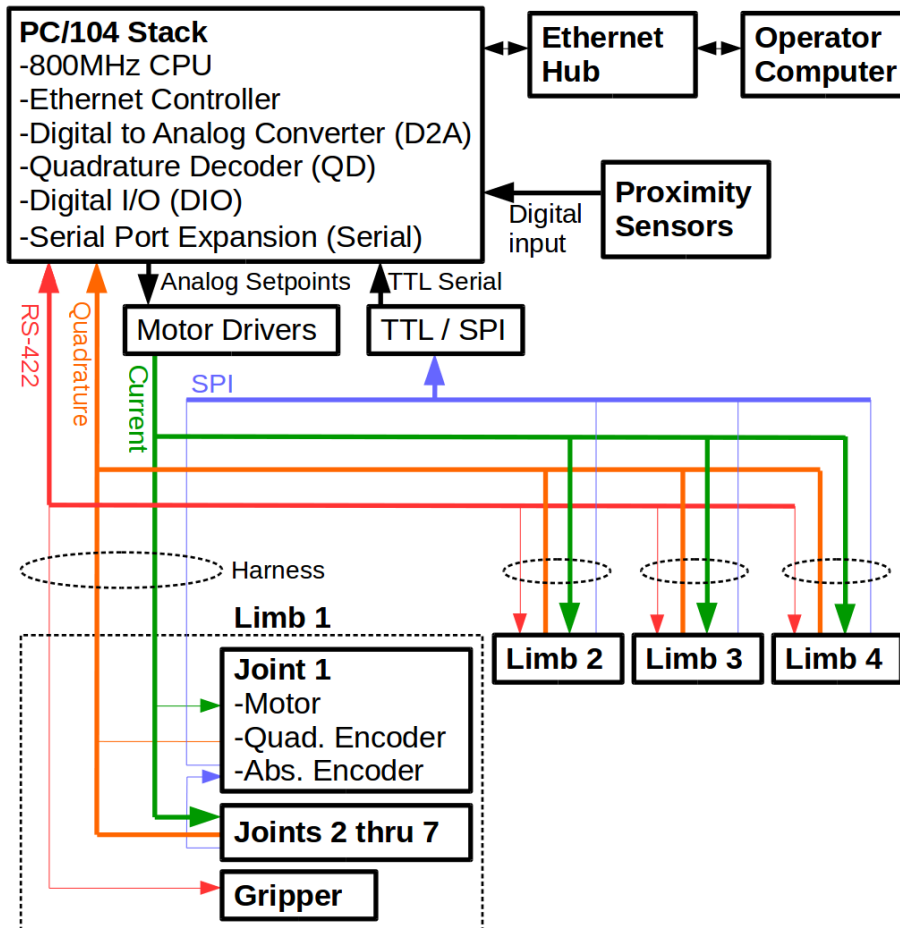


7-DOF Limbs with Identical Joints

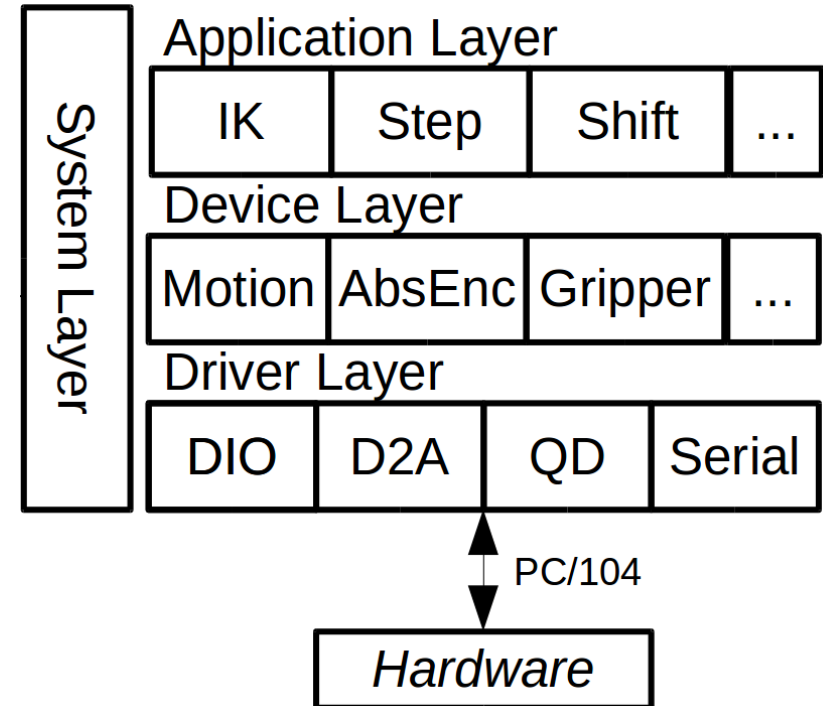


Electrical and Software Systems

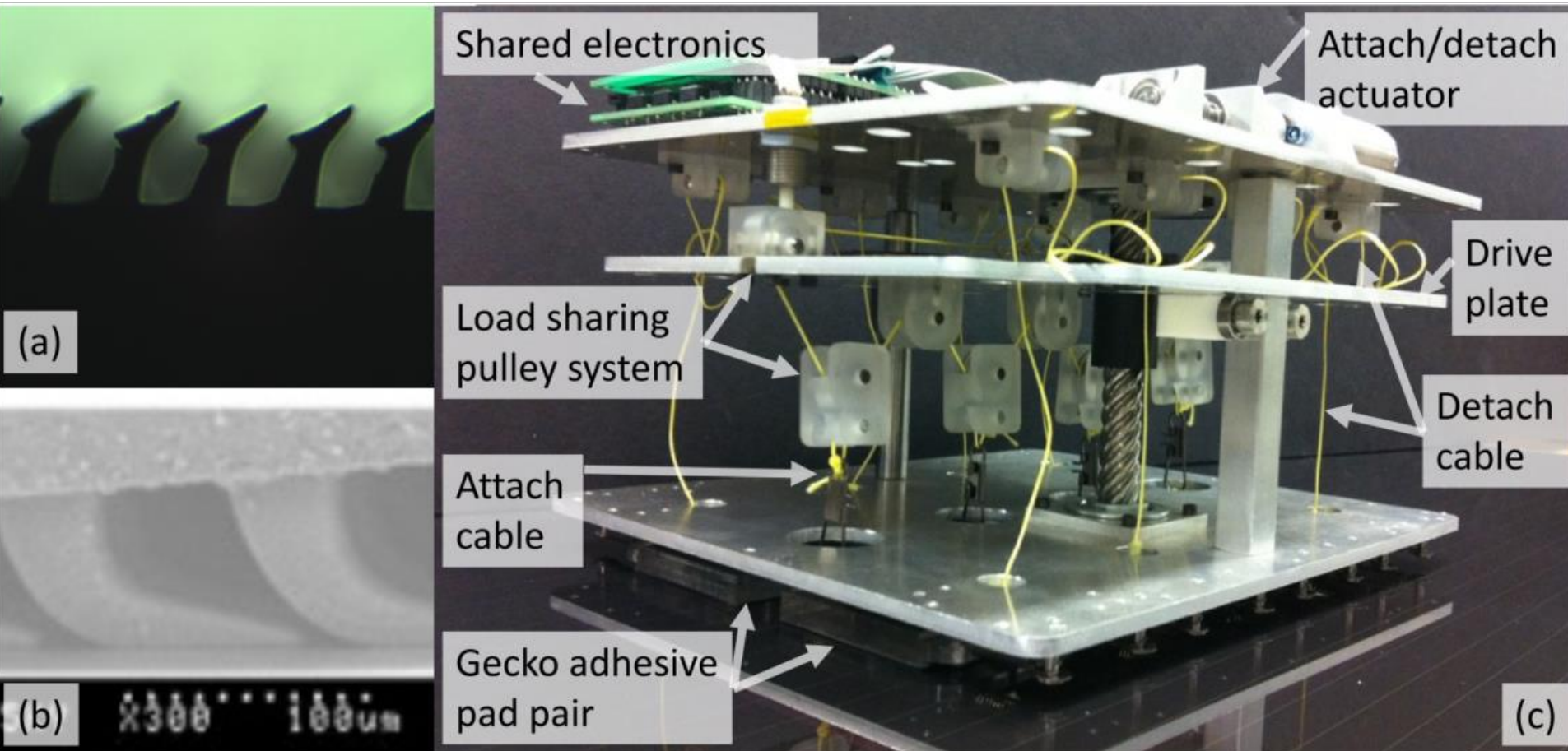
Centralized Electrical Design



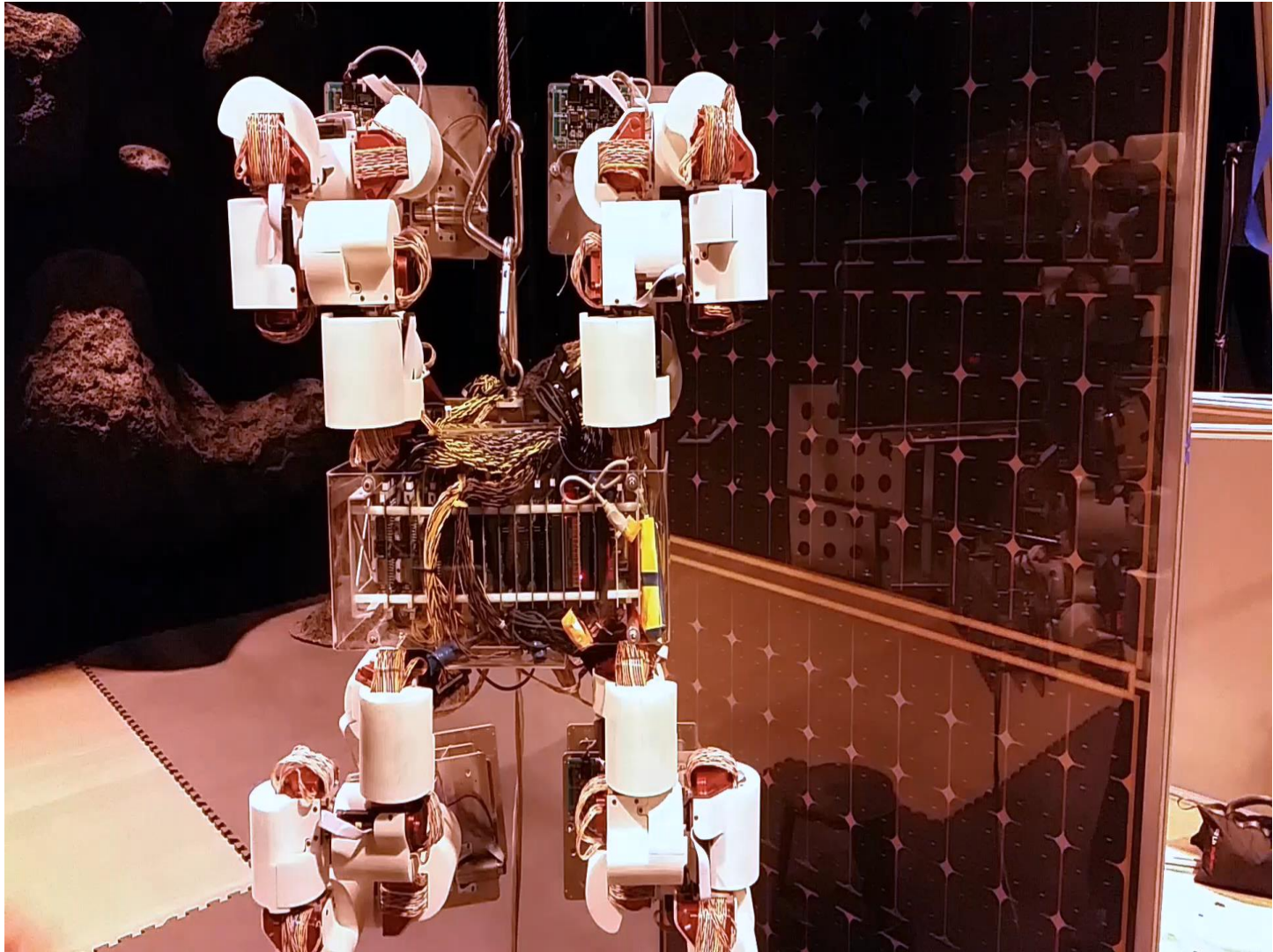
Layered Software Architecture



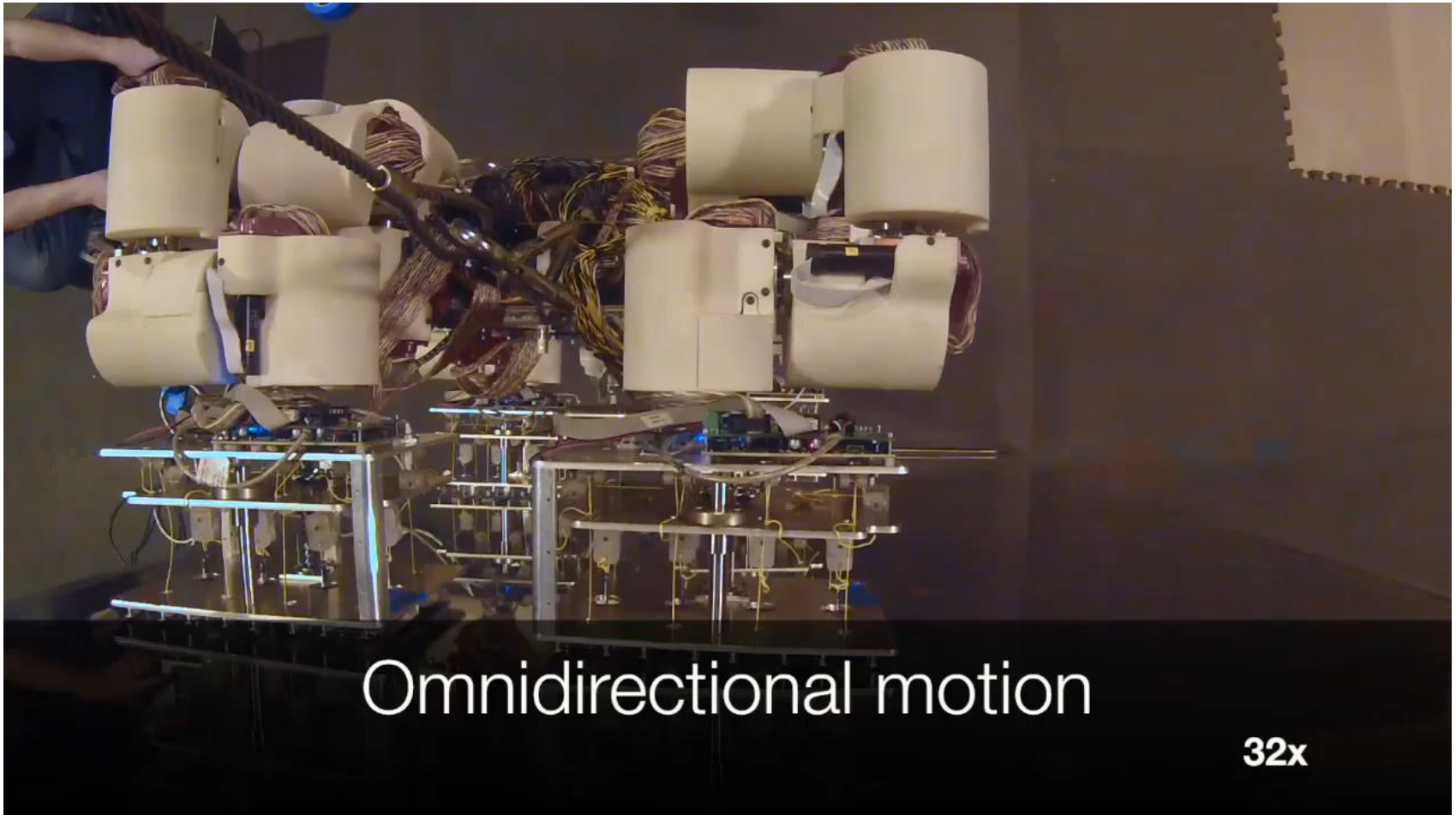
Gecko Grippers create Switchable Adhesion



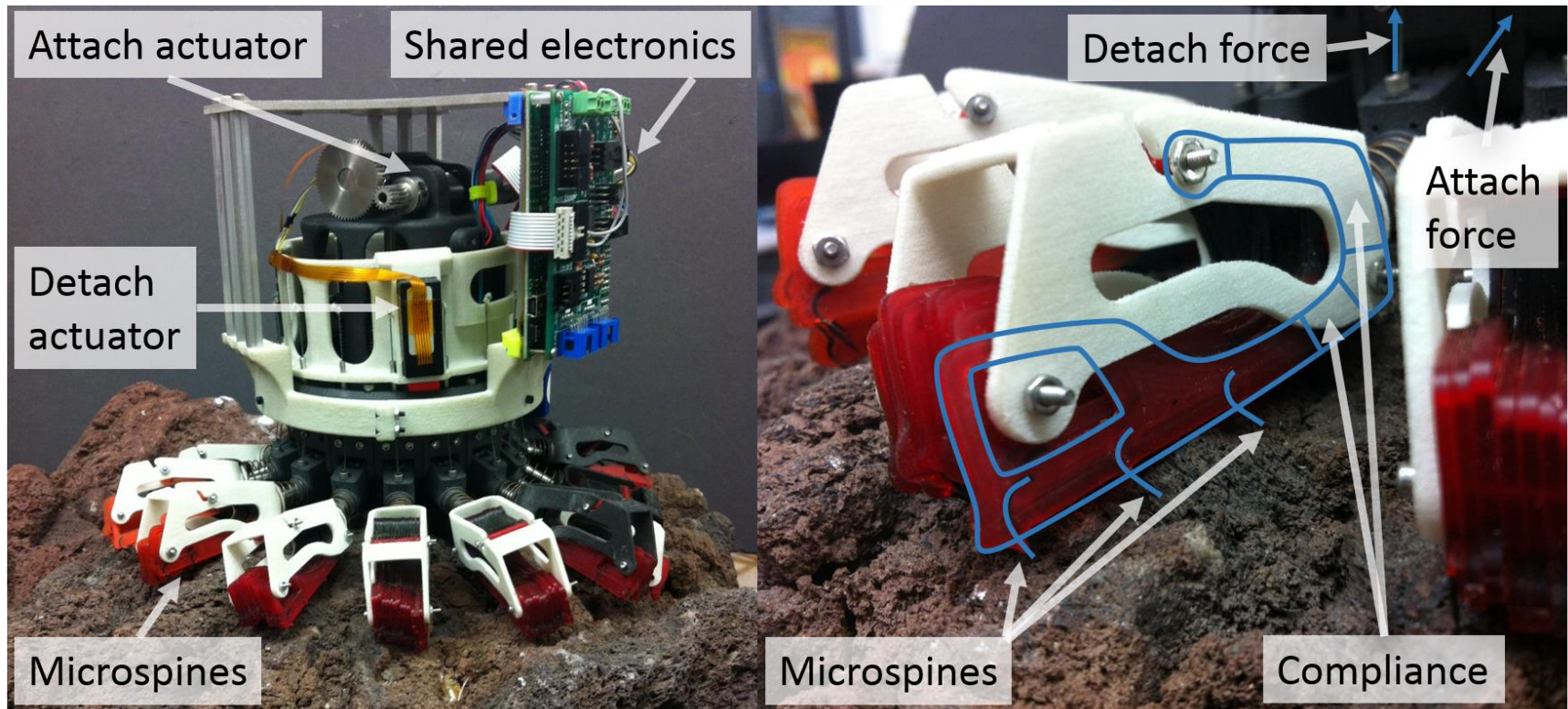
Gecko Grippers on LEMUR3



Solar Panel Mobility with Limbs and Grippers



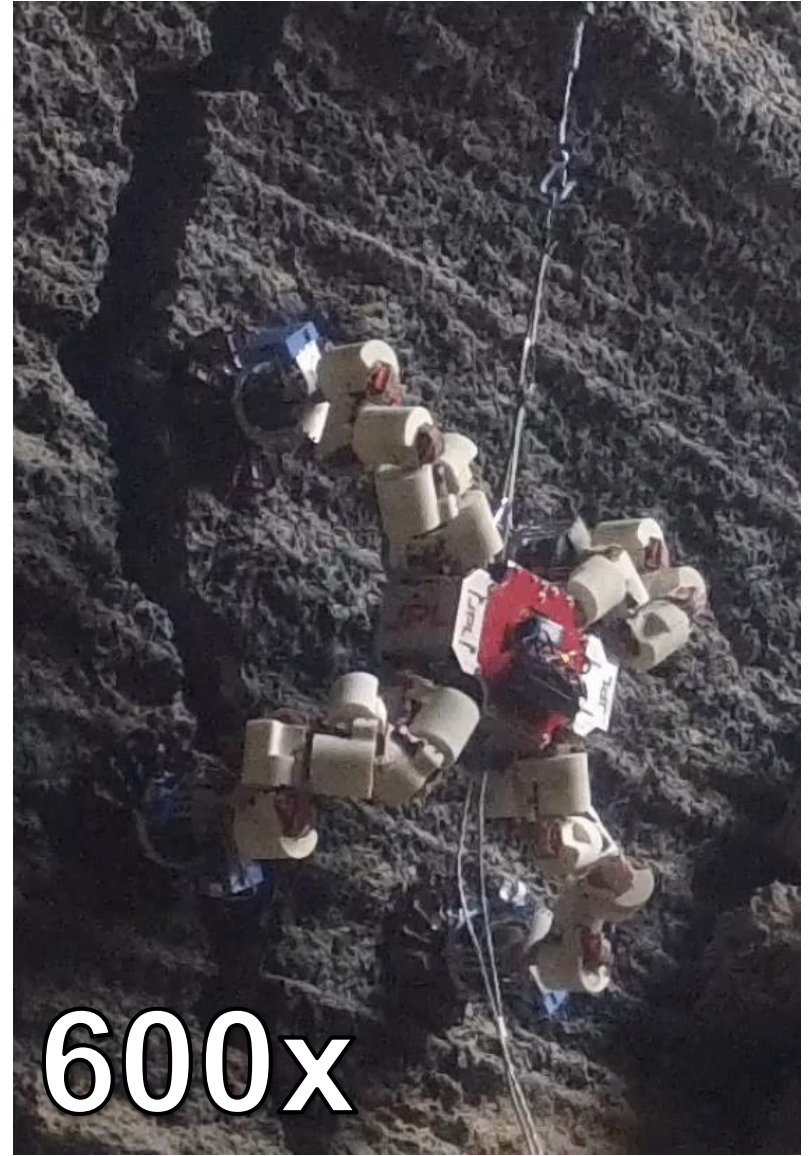
Microspine Grippers for Rugged Terrain



Lava Tube Mobility with Microspine Grippers

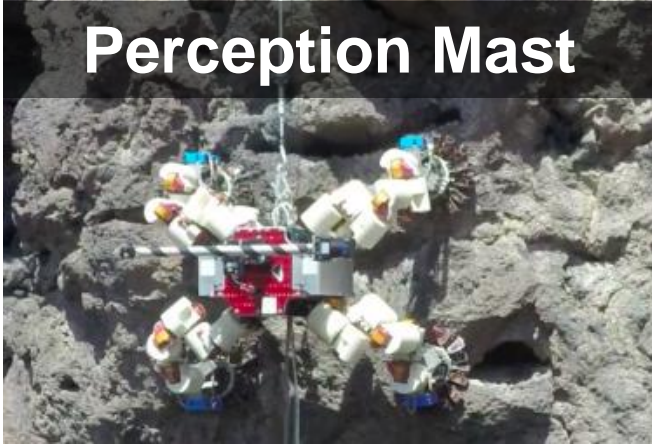


Big Skylight Cave, New Mexico

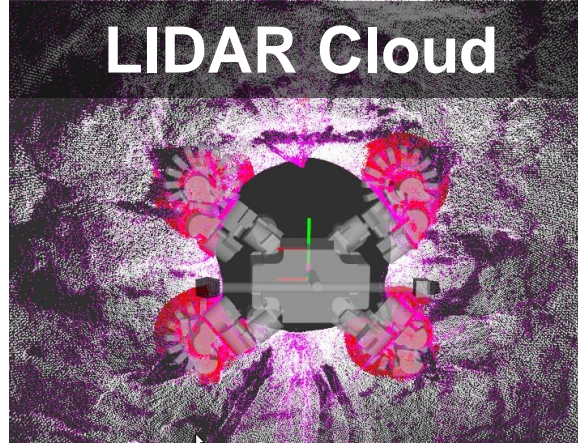


Current Work – Perception for Gripping

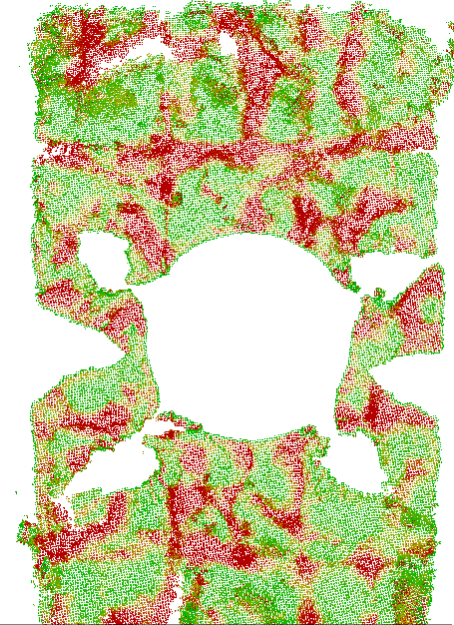
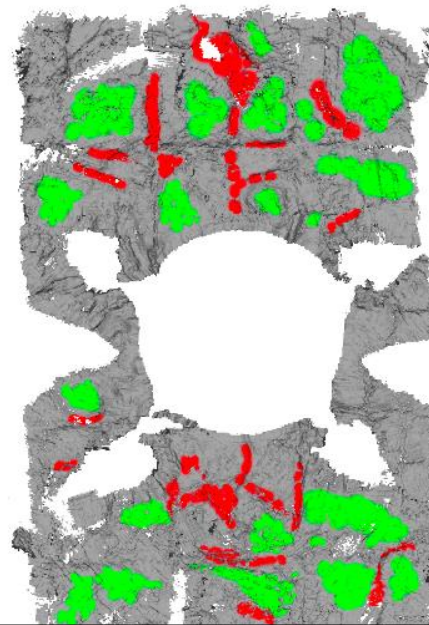
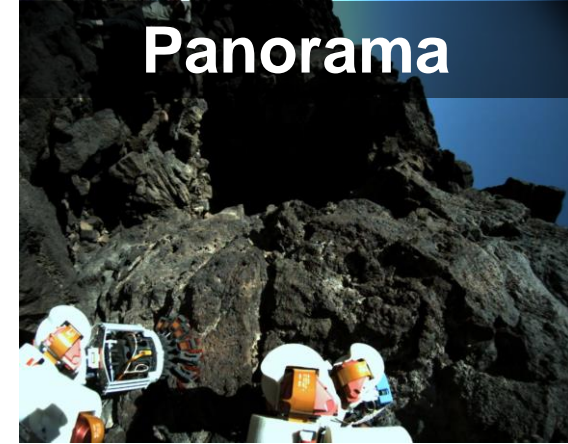
Perception Mast



LIDAR Cloud



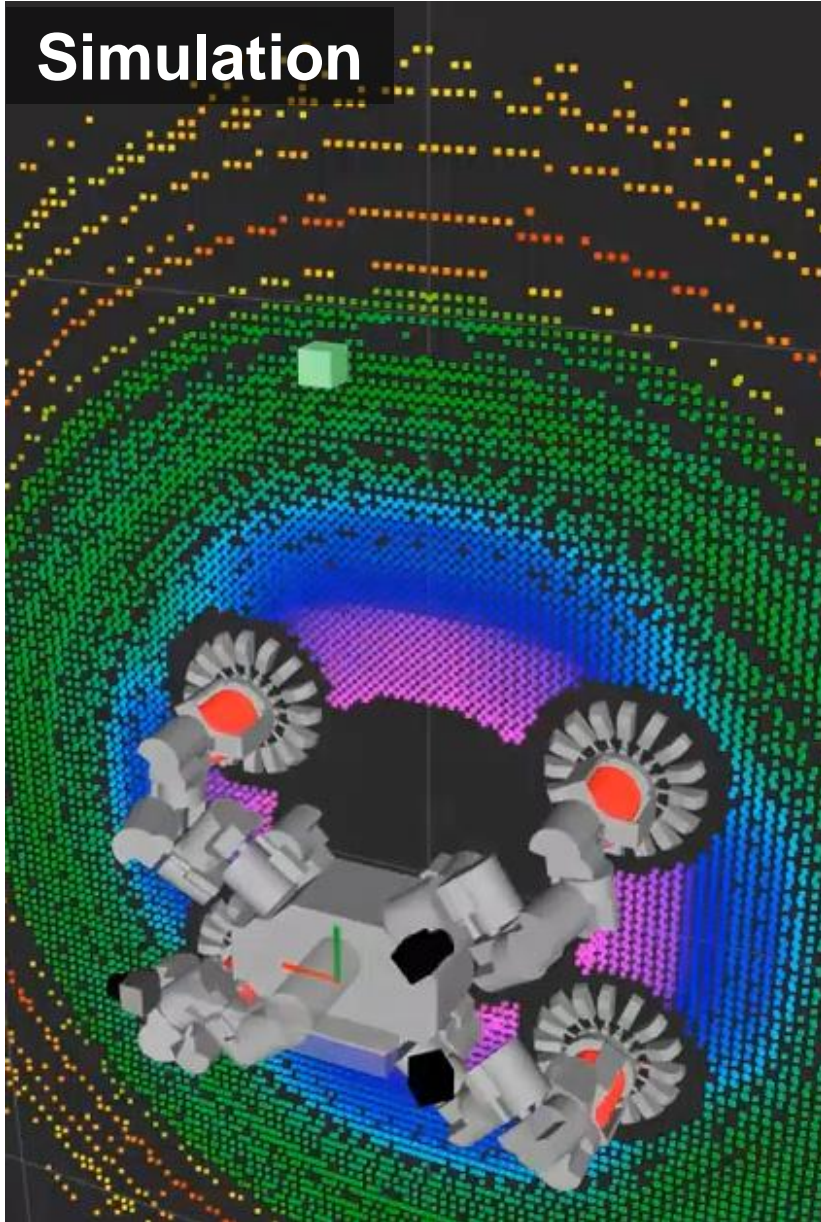
Panorama



Graspability Classifier using Expert Annotation

Current Work – Autonomous Climbing

Simulation

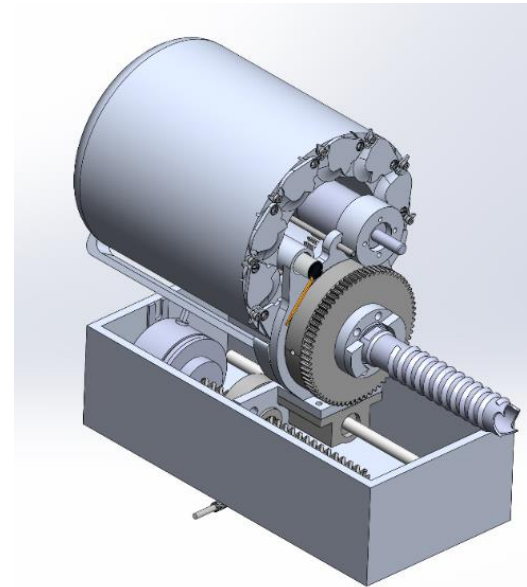


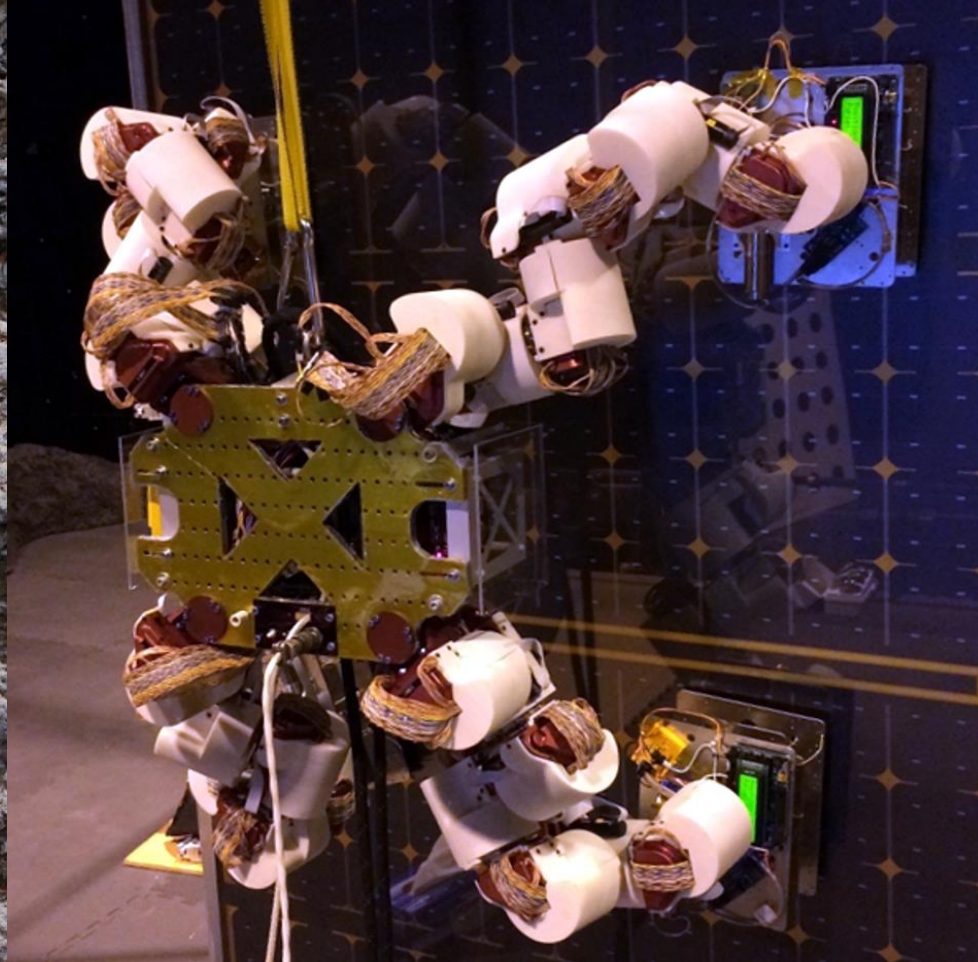
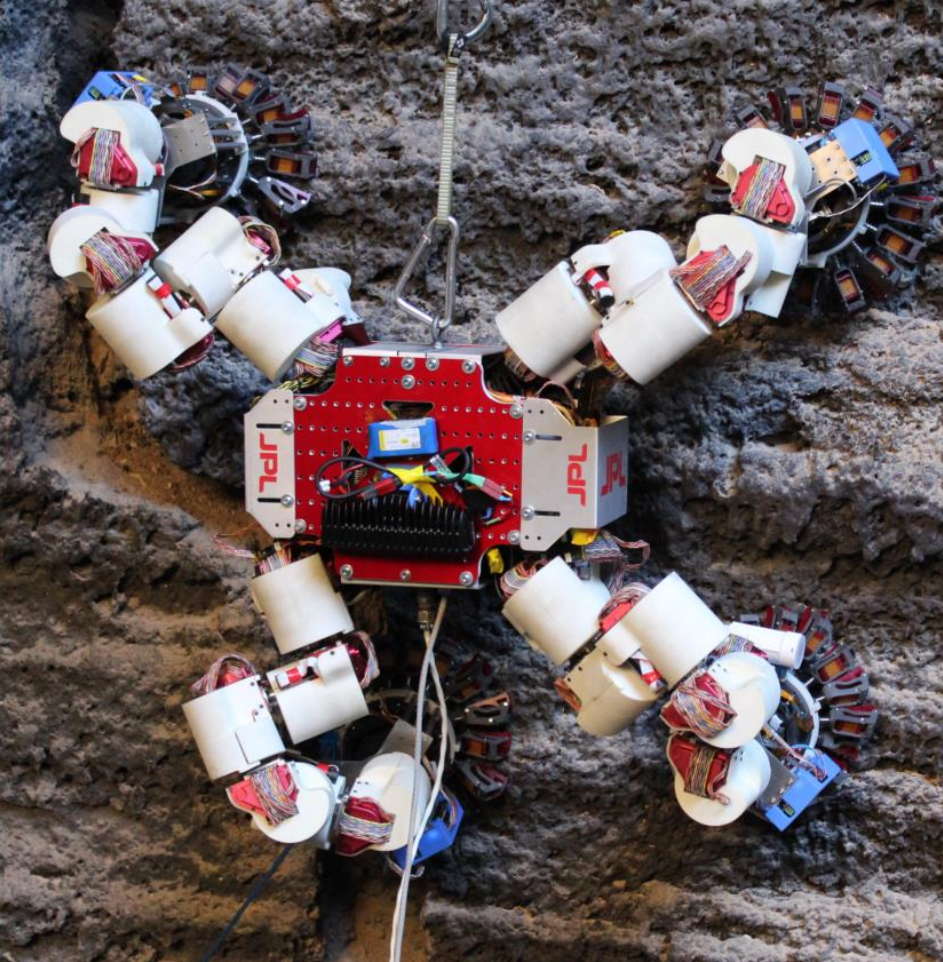
Pisgah Crater, California



300x

Current Work – Ice Screws for Fumaroles



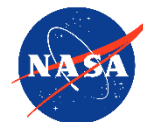


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